

What is claimed:

1. A restraint system equipped with a shoulder holder to increase survival chance in a real-world accident of a vehicle, train or an aeroplane or during turbulence-related vibrations of an aeroplane, comprising

- a seat belt (1d, 1e), consisting of several belt portions, at least one latch plate, a buckle assembly, a belt pretensioner and belt fittings;
- a shoulder holder (10d), having a pair of shoulder caps (10.2d), which, when in a resting position, are located in a seat backrest (3.2d, 3.2e); and
- a manually-operated rotatable device (28), having a pair of rotatable levers (28.5), retained by stop pieces (28.9) in the resting position, where the rotatable levers (28.5), having first ends, connected to the pair of shoulder caps (10.2d), and second ends, connected to each other by a shaft (28.7), are rotatably attached to a pair of casings (29), each of which, defined by an L-shaped plate (28.4) and two outer tubes (28.1, 28.2), connected to each other by a coupling wall (28.3), is height-adjustable, latchable and guided by inner tubes (71, 72) of a seat backrest frame (3.4d, 3.4e);

wherein

- a passenger is restrained by the seat belt (1d, 1e) and his shoulders are restrained by the shoulder caps (10.2d), moved by the rotatable device, manually-operated, from the resting position to an operative position;

where at least one shoulder belt portion of the seat belt (1d, 1e) is extended over at least one of the shoulder caps and over at least one U-shaped plate (10.15) thereof, when the rotatable levers (28.5) are manually rotated, causing release cams (28.6) of the rotatable levers to force a rotation of lock pawls (28.8), pre-loaded by first springs (28.10), thereby permitting locking pins (28.12), pre-loaded by second springs (28.13), and loosely guided in guide tubes (28.11), to move into holes (28.14) of the casings (29) and block the rotatable levers in both directions.

2. A restraint system equipped with a shoulder holder to increase survival chance in a real-world accident of a vehicle, train or an aeroplane or during turbulence-related vibrations of an aeroplane, comprising

- a seat belt (1, 1e), consisting of several belt portions, at least one latch plate, a buckle assembly, a belt pretensioner and belt fittings;
- a shoulder holder (10e), having a pair of shoulder caps (10.2e), which, when in a resting position, are located on an upper portion of a seat backrest (3.2d, 3.2e); and
- a motor-driven rotatable device (28a), having a drive apparatus (80) and a pair of rotatable levers (28.5a), having first ends, connected to the pair of shoulder caps (10.2e), and second ends, connected to each other by a shaft (28.7), are rotatably attached to a pair of casings (29a), each of which, defined by an L-shaped, partly laterally closed and partly laterally open plate (28.4a) and two outer tubes (41e, 41f), connected to each other by a coupling wall (28.3), is height adjustable, latchable and guided by inner tubes (71, 72) of a seat backrest frame (3.4d, 3.4e); and
- vibration-dampening energy absorbers (40e, 40f), having a number of clamping elements (42e, 42f) provided with sites of predetermined fracture (s), biased, arranged along the outer tubes (41e, 41f) and tautly, less tautly and/or loosely connected to the pair of rotatable levers via stop pieces (28.9a) by corresponding wires (47e, 47f);

wherein

a passenger is restrained by the seat belt (1, 1e) and his shoulders are restrained by the shoulder caps (10.2e), moved by the rotatable device, driven by the drive apparatus (80), from the resting position to an operative position;

where at least one shoulder belt portion of the seat belt (1, 1e) is extended over at least one of the shoulder caps and over at least one U-shaped plate (10.15) thereof, when the rotatable levers (28.5a) are rotated by the drive apparatus (80), causing release cams (28.6a) of the rotatable levers to force a rotation of lock pawls (28.8a), pre-loaded by first springs (28.10a), thereby permitting locking pins (28.12), pre-loaded by second springs (28.13), and loosely guided in guide tubes (28.11), to move into holes (28.14) of the casings (29a) and block the rotatable levers in one direction;

where in the event of a real-world accident or a turbulence a forward motion of the torso and head rotates the rotatable levers in another direction through the openings of the L-shaped, partly laterally closed and partly laterally plates (28.4a), thus moving the clamping elements (42e, 42f) along the corresponding tubes (41e, 41f) resulting in a work of deformation and friction, during which vibrations are dampened and a stored energy is released by fracture of the sites of predetermined fracture of the clamping elements in excess of respective threshold values.

3. A restraint system equipped with a shoulder holder to increase survival chance in a real-world accident of a vehicle, train or an aeroplane or during turbulence-related vibrations of an aeroplane, comprising

a seat belt (1, 1b, 1e), consisting of several belt portions, at least one latch plate, a buckle assembly, a belt pretensioner and belt fittings;

a shoulder holder (10, 10b, 10f), having a pair of shoulder caps (10.2, 10.2b, 10.2f) with open apertures to receive the belt portions;

a pair of latch plates (10.1b), connected to the shoulder caps (10.2, 10.2b, 10.2f), with open apertures, in which the belt portions are loosely secured by quick-release pins (10.10), when the shoulder holder and the seat belt are fitted together, and released by withdrawal thereof for removal, when the shoulder holder is withdrawn; and

at least one pair of buckle assemblies (18a / 19a to 18n / 19n), attached in a seat backrest (3.2a, 3.2c);

wherein

a passenger is restrained by the seat belt (1, 1b, 1e) and his shoulders are restrained by the shoulder caps (10.2, 10.2b, 10.2f) upon plug-in connection of the latch plates (10.1b)

with the buckle assemblies (18a / 19a to 18n / 19n); and

at least one shoulder belt portion of the seat belt (1, 1b, 1e) is extended over the open aperture of the corresponding shoulder cap and loosely secured in the open aperture of the latch plate.

4. A restraint system equipped with a shoulder- and neck holder to increase survival chance in a real-world accident of a vehicle, train or an aeroplane or during turbulence-related vibrations of an aeroplane, comprising

a seat belt (1a, 1c, 1e), consisting of several belt portions, at least one latch plate, a buckle assembly, a belt pretensioner and belt fittings;

a one-piece shoulder- and neck holder (10a, 10c), defined by a neck cap (10.4a, 10.4c) and a shoulder cap (10.2a, 10.2c) with open apertures to receive the belt portions;

a pair of latch plates (10.1b), connected to the shoulder cap (10.2a, 10.2c), with open apertures, in which the belt portions are loosely secured by quick-release pins (10.10), when the one-piece shoulder- and neck holder and the seat belt are fitted together, and released by withdrawal thereof for removal, when the one-piece shoulder- and neck holder is withdrawn; and

at least one pair of buckle assemblies (18a / 19a to 18n / 19n), attached in a seat backrest (3.2a, 3.2c);

wherein

a passenger is restrained by the seat belt (1a, 1c, 1e) and his shoulders and his neck are restrained by the shoulder cap (10.2a, 10.2c) and neck cap (10.4a, 10.4c) upon plug-in connection of the latch plates (10.1b) with the buckle assemblies (18a / 19a to 18n / 19n); and

at least one belt shoulder portion of the seat belt (1a, 1c, 1e) is extended over the corresponding open aperture of the shoulder cap and loosely secured in the open aperture of the respective latch plate.

5. The restraint system according to claim 2, wherein the shoulder cap (10.2e), recessed about a supporting tube (3.61) of a head rest (3.6), is reinforced by a reinforcing plate (10.13).

6. The restraint system equipped with a shoulder- and neck holder according to claim 2, further comprising a neck holder, having a pair of neck caps (10.4, 10.4b), attached to the pair of shoulder caps (10.2e), to restrain the passenger's neck in the operative position.

7. The restraint system according to claim 6 wherein the drive apparatus (80) is activated by a separately operated switch.

8. The restraint system according to claim 6, wherein the drive apparatus is activated by a controller, monitoring the speed, in excess of a threshold speed.

9. The restraint system according to claim 6, wherein the drive apparatus is activated by an accelerator pedal.

10. The restraint system according to claim 6, wherein the drive apparatus is activated when a sensor senses an acceleration, which exceeds a threshold acceleration.

11. The restraint system according to claim 6, wherein upon a pressure on a release button (87a to 87c) of the seat the drive apparatus (80) moves the shoulder- and neck holder back from the operative position to the resting position.

12. The restraint system according to claim 6, wherein the lap buckle assembly (9.1) has a master release button (84), which is connected to switches of the drive apparatus (80) and electrical motors (4.2b) of the remaining buckle assemblies of the seat belt via respective deactivating cables, where the master release button (84), when depressed, disengages all the latch plates and moves the shoulder- and neck holder back from the operative position to the resting position.

13. The restraint system equipped with a shoulder- and neck holder according to claim 3, further comprising

a neck holder, having a pair of neck caps (10.4, 10.4b), insertably attached to the pair of shoulder caps (10.2, 10.2b, 10.2f), to restrain the neck upon use, where the neck caps can be detached therefrom and removed.

14. The restraint system according to claim 13, wherein the shoulder- and neck holder (10, 10b, 10f) is provided with at least one energy absorber (10.3, 10.3a, 10.5, 10.5a, 10.5c).

15. The restraint system according to claim 14, wherein the energy absorber is fastened to the cap by an adhesive fastener and detachable therefrom by opening the fastener.

5 16. The restraint system according to claim 3, wherein the shoulder cap is shoulder-shaped.


17. The restraint system according to claim 14, wherein the energy absorber is shoulder-shaped.

18. The restraint system according to claim 13, wherein the neck cap is neck-shaped.

19. The restraint system according to claim 14, wherein the energy absorber is neck-shaped.

10 20. The restraint system according to claim 19, wherein the energy absorber (10.5a), arranged in the neck cap (10.4a), serves as a neck collar having a wide portion for the chin.

21. The restraint system according to claim 3, wherein the latch plate of the holder is provided with an energy absorber (10.9).

 15 22. The restraint system according to claim 13, wherein the shoulder- and neck cap, provided with a flange (10.12), is adjustable in height by rotating a bolt (10.7) in a threaded hole of the flange (10.12).

23. The restraint system according to claim 13, wherein the shoulder- and neck cap, provided with a flange (10.12f), is adjustable in width by rotating a bolt (10.6a) in a threaded hole of the flange (10.12f).

20 24. The restraint system equipped with the shoulder- and neck holder and with vibration-dampening energy absorbers according to claim 13, further comprising at least one vibration-dampening energy absorber (30, 40, 50), which consists of

a retaining element (31, 41, 51), serving as a member of a seat frame, generally representing a seat-cushion- or seat backrest frame, and
25 at least one clamping element (32, 32.1 to 32.n, 42, 42.1 to 42.n, 52, 52.1 to 52.n), connected to the buckle assembly of the seat by means of at least one control-wire (37, 47, 57), biased, arranged along the retaining element and provided with sites of predetermined fracture (s), which have at least one threshold value.

30 25. The restraint system according to claim 24, wherein the retaining element is integrated into the seat frame.

26. The restraint system according to claim 24, wherein the clamping element has open and tube-shaped profile.

27. The restraint system according to claim 24, wherein the retaining element is tube-shaped.

35 28. The restraint system according to claim 24, wherein a longitudinal rib (41.1, 51.1) is arranged to the retaining element.

29. The restraint system according to claim 28, wherein both edges of the clamping element are loosely guided by the longitudinal rib in longitudinal direction.

30. The restraint system according to claim 28, wherein a stop element (41.3) is arranged to the longitudinal rib.

31. The restraint system according to claim 28, wherein the thickness of the longitudinal rib increases in longitudinal direction, in which the clamping element moves.

5 32. The restraint system according to claim 24, wherein the clamping element is cone-shaped.

33. The restraint system according to claim 24, wherein the retaining element (51) is cone-shaped.


10 34. The restraint system according to claim 24, wherein at least one stop pin (46, 46.1 to 46.n) is laterally arranged to the retaining element, where the stop pin blocks a movement of the clamping element, thus resulting in fracture of the sites of predetermined fracture.

35. The restraint system according to claim 24, wherein contact surfaces of the retaining element have arbitrary friction coefficients (μ_0).

15 36. The restraint system according to claim 24, wherein contact surfaces of the retaining element are provided with a soundproofing material (83).

37. The restraint system according to claim 24, wherein contact surfaces of the clamping element have arbitrary friction coefficients (μ_0).

38. The restraint system according to claim 24, wherein contact surfaces of the clamping element are provided with a soundproofing material (83).

 20 39. The restraint system according to claim 29, wherein end portions of a complementary wires (37a1), connected to the control-wire (37), are inserted into both cylinder-shaped edges (37c1) of the clamping elements (32) and secured by clamping the cylinder-shaped edges (37c1).

25 40. The restraint system according to claim 24, wherein the clamping element is provided with a pair of ribs, whereto several pairs of adjusting holes (L_1 to L_c) are arranged.

30 41. The restraint system according to claim 24, wherein a set of vibration-dampening energy absorbers comprises the retaining element, at least one stop pin, at least one stop element, one control-clamping element, connected to the control-wire, and complementary clamping elements with/without sites of predetermined fracture, where all clamping elements, arranged along the retaining element, are tautly, less tautly and/or loosely connected to each other by means of complementary wires.

35 42. The restraint system according to claim 41, wherein an energy-absorbing, vibration-dampening device comprises a couple member (1.2a, 1.2b) and the sets of vibration-dampening energy absorbers, the control-wires of which are tautly, less tautly and/or loosely connected to the couple member.

43. The restraint system according to claim 42, wherein a guide piece (4.7a), fastened to the seat frame, has

a pair of engaging parts (4.10a), form-locking connected to the corresponding apertures of a housing (4.8a) of the buckle assembly; and

40 a recess (4.5a) to loosely guide a tie band (1.1a), having a first and second end connected to the buckle assembly and the couple member.

44. The restraint system according to claim 42, wherein a guide piece (4.7b), fastened to the seat frame, has
a pair of engaging parts (4.10b), form-locking connected to the corresponding apertures of a housing (4.8b) of the buckle assembly; and
5 a longitudinal groove (4.5b) to loosely guide a tie band (1.1b), having a first and second end connected to the buckle assembly and the couple member.

45. The restraint system according to claim 42, wherein a housing (4.8c), movable along a pair of tubes (27.3) of the seat backrest frame and latchable thereon, has
10 an aperture to receive an engaging part (4.10c) of the buckle assembly, through a hole (2.3) of which a wire is protruded and both end portions of the wire, serving as tie bands, are secured by a mutual bracket (1.7); and
two holes (4.5c) to loosely guide the tie bands, connected to the couple members.

46. The restraint system to absorb energy and dampen vibrations in the real-world accident, a submarining, a rollover or the turbulence-related vibrations according to claim 43, wherein
15 the lap belt portion (1.3) of the seat belt (1d, 1e), provided with at least one movable anti-submarining latch plate (11, 25), is subdivided into two belt portions;
which restrain both thighs of the passenger upon plug-in connection of the movable anti-submarining latch plate (11, 25) with one of anti-submarining buckle assemblies (7, 8, 8a)
of a seat cushion, whose frame is equipped with the guide pieces (4.7a) and the energy-absorbing, vibration-dampening device;
20 where release cables (4.2) connect release buttons of the submarining buckle assemblies to a mutual release button (84o), located on the seat cushion, which, when depressed, disengages the movable anti-submarining latch plate (11, 25) while the restraint of the belted passenger remains unaffected.

47. The restraint system according to claim 13, wherein the lap buckle assembly (9.1) has a master release button (84);
25 which is connected to release buttons of the remaining buckle assemblies of the seat belt and to release buttons of the pairs of buckle assemblies, to one of which the latch plates of the holder are plug-in connected;
30 where the master release button (84), when depressed, disengages all the latch plates of the holder and seat belt.

48. The restraint system according to claim 3, wherein the shoulder holder is attached to the seat for the purpose of storage and detachable therefrom by depressing a release button (87a to 87c) of the seat.

49. The restraint system according to claim 13, wherein the shoulder- and neck holder is attached to the seat for the purpose of storage and detachable therefrom by depressing a release button of the seat.

50. An energy-absorbing, vibration-dampening safety seat according to claim 49, wherein sets of vibration-dampening energy absorbers, the seat belt, holder and seat are integrated
40 into a safety adult-seat;
which is transformed into a safety child-seat when a detachable front portion of the seat cushion (3.1a) serves as a shoulder- and neck holder (10a), the latch plates of which are plug-in connected to one of the pairs of buckle assemblies (18a / 19a to 18n / 19n) of the seat backrest, to restrain shoulders and a neck of a belted child and the space thereof is
45 exploited to accommodate legs of the child sitting on the rear portion thereof;
where the safety child-seat can be converted back into the safety adult-seat.

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51. An energy-absorbing, vibration-dampening safety baby-cot according to claim 50, wherein

the safety child-seat is transformed into a safety baby-cot when the seat backrest is flipped downwards;

5 where the safety baby-cot can directly be converted back either into the safety child-seat or into the safety adult-seat.

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52. The restraint system according to claim 46, wherein the lap buckle assembly (9.1) has a master release button (84),

10 which is connected to release buttons of the remaining buckle assemblies of the seat belt and to release buttons of the pairs of buckle assemblies, to one of which the latch plates of the holder is plug-in connected, as well as to the release buttons of the anti-submarining buckle assemblies,

where the master release button (84), when depressed, disengages the movable anti-submarining latch plate and all the latch plates of the holder and seat belt.

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